Dell™ PowerVault™ 715N Systems Installation and Troubleshooting Guide

Notes, Notices, and Cautions

NOTE: A NOTE indicates important information that helps you make better use of your computer.

NOTICE: A NOTICE indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

CAUTION: A CAUTION indicates a potential for property damage, personal injury, or death.

Initial release: 25 Sep 01

Introduction

Dell™ PowerVault™ 715N Systems Installation and Troubleshooting Guide

- Other Documents You Might Need
- Getting Help

The Dell™ PowerVault™ 715N network attached storage (NAS) appliance enables you to easily add storage to a workgroup, small office or small business network and offload the file management responsibilities from the server. The NAS appliance is a "headless" device, meaning it can be managed from any browser. It offers the data security capabilities of general-purpose servers.

The system includes the following service features to make troubleshooting and repair easy and effective:

- A temperature monitor that shuts down the system if the temperature exceeds the threshold setting

- System Diagnostics, which checks for hardware problems

- PowerVault NAS Manager, which is used through a browser to monitor and manage the system.

- A chassis and system board that simplifies removing and replacing components

- Microsoft® Windows® Powered operating system help (available through Terminal Services)

The following system upgrade options are available:

- Additional memory

- Optional PCI expansion-card

Other Documents You Might Need

In addition to this *Installation and Troubleshooting Guide*, the following documentation is included with your system:

- The *User's Guide*, which describes system features and technical specifications and the System Setup program.

- The *System Administrator's Guide,* which provides system operation and management information.

- The PowerVault NAS Manager online help.

- *The System Information* document for important safety, regulatory, and warranty information.

- The *Rack Installation Guide,* which describes how to unpack and set up the rack and install your system in the rack.

You might also have one or more of the following documents.

> **NOTE:** Documentation updates are sometimes included with the system to describe changes to the system or software. Always read the updates before consulting any other documentation because the updates often contain information that supersedes the information in the other documents.

- Documentation is included with any options you purchase separately from the system. This documentation includes information that you need to configure and install these options in your system.

- Technical information files—sometimes called "readme" files—may be installed on the hard drive to provide last-minute updates about technical changes to the system or advanced technical reference material intended for experienced users or technicians.

Getting Help

If at any time you do not understand procedures described in this guide, or if your system does not perform as expected, Dell provides a number of tools to help you. For more information about the help tools, see "[Getting Help](#)."

Indicators, Messages, and Codes

Dell™ PowerVault™ 715N Systems Installation and Troubleshooting Guide

- Bezel Indicators
- System Messages
- System Beep Codes

The system can identify problems and alert you of them. When a problem occurs, a message might appear on the screen (if using console redirection) or a beep code might sound.

Several different types of messages can indicate when the system is not functioning properly:

- System messages

- System beep codes

- Warning messages

- Alert messages

- Diagnostics messages

- Light-emitting diode (LED) indicators for the system and the hard drives

The system indicators are illustrated in Figure 2-1. This section also describes each type of message and lists the possible causes and actions you can take to resolve any problems indicated by a message. To determine what type of message you have received, see the following sections.

> **NOTE:** To view the messages, you can use the console redirection function on the admin port (COM1). See the *System Administrator's Guide* for more information about console redirection.

Bezel Indicators

When the bezel is in place on the system, it has two types of indicators (see Figure 2-1). The indicators along the bottom of the bezel indicate status of the hard drives, and the indicators near the power button indicate status of the system.

Figure 2-1. Bezel Indicators
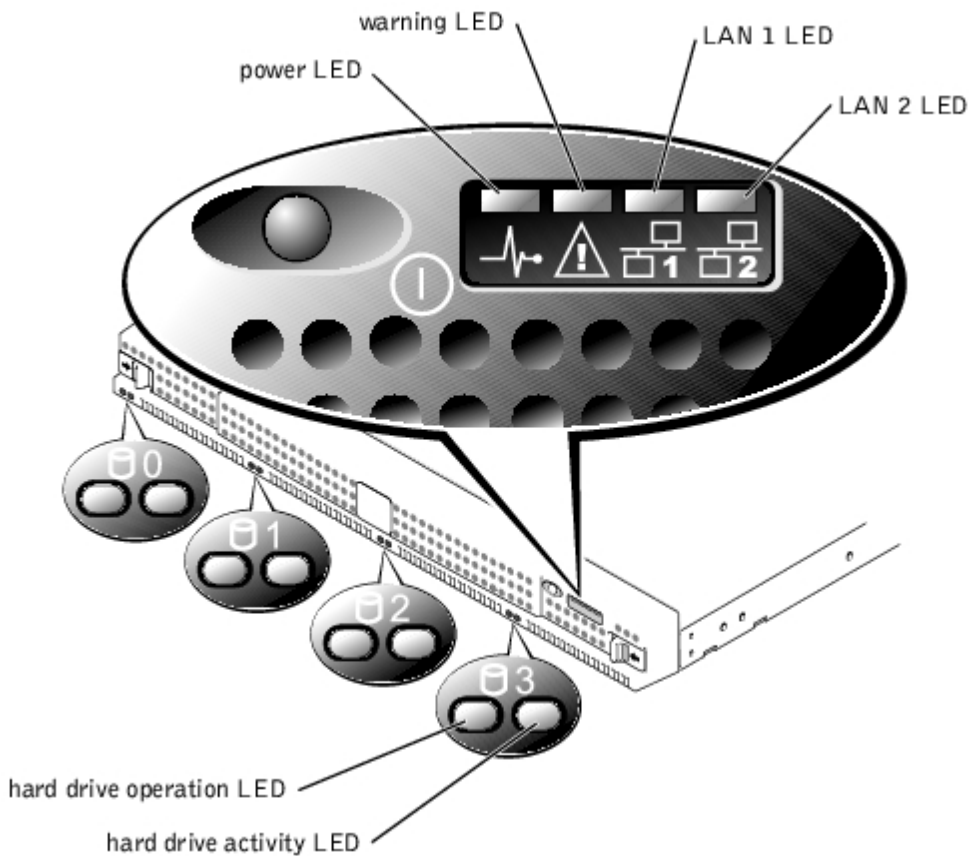
Power LED

- Green indicates normal operation.

- Flashing amber indicates a system failure.

Warning LED

- Any pattern or color indicates a system error. See "System Messages" and "System Beep Codes" for more information about possible system errors.

- Off indicates normal operation.

LAN 1 LED

- Green indicates the system is connected to the network through the LAN 1 port.

- Flashing green indicates activity between the system and other devices on the network.

- Off indicates the system is disconnected from the network or the LAN 1 port is not working properly.

LAN 2 LED

- Green indicates the system is connected to the network through the LAN 2 port.

- Flashing green indicates activity between the alliance and other devices on the network.

- Off indicates the system is disconnected from the network or the LAN 2 port is not working properly.

Hard Drive LEDs

Each hard drive has two LEDs. The LEDs are most visible when the bezel is attached to the front of the system. The LEDs provide the following information for each hard drive:

- When the LED on the left side is green, the hard drive is installed in the drive bay and working. When this LED is amber, the hard drive is installed in the bay, but it is not working properly.

- When the LED on the right side flashes amber, the hard drive is active.

System Messages

System messages alert you to a possible operating system problem or a conflict between the software and hardware.

To view system messages, perform the following steps:

1. Connect a client system to the appliance and enter the BIOS Setup utility.

   See your *User's Guide* for information about entering the BIOS Setup utility.

2. Select **Advanced CMOS Setup**.

3. Select **View DMI Event** and press <Enter>.

Table 2-1 lists the system error messages and the probable cause for each message.

Table 2-1. System Messages

Message	Cause	Corrective Action
HDD Controller Failure	BIOS cannot communicate with the hard drive controller.	Check the connections to the hard drive.
CMOS Battery Low	The battery on the system is low or faulty.	Replace the system battery. See "Replacing the System Battery" in "Installing System Board Options." If the problem persists, replace the system board. See "Getting Help," for information about obtaining technical assistance.
CMOS Checksum Bad	The checksum value (CMOS RAM settings) differs from the current value.	In the BIOS Setup utility, select to autoload the optimal setting. See "Using the BIOS Setup Utility," in your *User's Guide* for information about changing this setting.
CMOS Time and Date Not Set	The BIOS does not have date and time values.	Use the BIOS Setup utility to set the time and date. See "Using the BIOS Setup Utility," in your *User's Guide* for information about changing this setting.
Pri Master HDD error	Primary hard drive is not responding.	Replace the primary hard drive. See "Installing Hard Drives." If the problem still persists, see "Getting Help," for information about obtaining technical assistance.
Sec Master HDD error	Secondary hard drive is not responding.	Replace the secondary drive. See "Installing Hard Drives." If the problem still persists, see "Getting Help," for information about obtaining technical assistance.
Cache Memory Error	Cache memory is defective.	Disable the cache in the BIOS Setup utility. See "Using the BIOS Setup Utility," in your *User's Guide* for information about changing this setting.

System Beep Codes

When an error that cannot be reported through a console redirection screen occurs during a boot routine, the system might emit a series of beeps that identify the problem. For example, five beeps indicate a problem with the processor. This information is valuable to the Dell technical support representative if you must call for technical assistance.

When a beep code is emitted, record it, and then look it up in Table 2-2. If you are unable to resolve the problem by looking up the meaning of the beep code, use the System Diagnostics to identify a more serious cause. If you are still unable to resolve the problem, see "Getting Help," for information about obtaining technical assistance.

Table 2-2. System Beep Codes

Beeps	Cause	Corrective Action
1	The memory refresh circuitry on the system board is faulty.	Replace the system board. See "Getting Help" for information about obtaining technical assistance.
2	Base 64 KB memory failure.	Switch memory modules. See "Adding Memory" in "Installing System Board Options" for information about replacing memory modules.
5	Processor error.	Remove and reseat the microprocessor. See "Replacing a Microprocessor" in "Installing System Board Options." If the problem persists, replace the microprocessor. If the problem still persists, see "Getting Help," for information about obtaining technical assistance.
7	Processor exception interrupt error.	
10	ROM Checksum error	The ROM checksum value does not match the value encoded in the BIOS. Call Dell technical support. See "Getting Help" for information about obtaining technical assistance.

Back to Contents Page

Running System Diagnostics

Dell™ PowerVault™ 715N Systems Installation and Troubleshooting Guide

- Using the System Diagnostics Program
- Diagnostic Test Types
- Selecting and Running Tests
- Logging Test Results
- LED Indicators

The system's BIOS ROM contains and launches the diagnostic software. You can run tests on a selected component, or you can create batches. The basic test modes include:

- **User Interactive** tests detect faults on a specified component. You can select any single test from the menu bar and run the test with desired parameters.

- **Non-Interactive Batch** mode runs selected tests in a batch without user interaction. To define the parameters for this test, highlight the **Options** menu and press <Enter>. Highlight **Test Parameter**, press <Enter>, and enter the parameters. You can choose to run tests once, several times, for a specific time period, or continuously.

- **Interactive Batch** mode requires some user interaction during the batch test. For example, on the speaker test, you must judge whether the speaker produces appropriate sounds.

  When you set the **Interactive test** parameter to **Yes**, the **Non-Interactive Batch** test mode described above becomes **Interactive Batch** mode, which requires user intervention during the batch test.

- **Quick Batch Test** mode runs a quick system check to make sure that all system components work correctly, which skips tests that take a long time, such as hard drive tests.

Using the System Diagnostics Program

To enter the System Diagnostics program, perform the following steps:

1. Connect the client system to the system with a serial cable.

2. Turn on the client system and set up a Hyperterminal connection.

   a. Click the **Start** button and point to **Programs—>Accessories —>Communications —>Hyperterminal**.

   b. Select **115200** for the **Bits per second**, **8** for **Data Bits**, **None** for **Parity**, **1** for **Stop Bits**, and **Xon\Xoff** for **Flow control**.

3. Restart the appliance.

4. Press <F2> immediately after you see the following message:

   ```
   Press <F2> to Enter the Function Select Menu
   ```

   NOTE: If you use a version of Microsoft® Windows® 2000 earlier than Service Pack 2, the function keys do not work. You must press <Esc><2>.

   If you wait too long and your operating system begins to boot, allow the appliance to complete the boot, and then shut down the appliance and try again.

5. When a menu appears, press <4> to run System Diagnostics.

6. When a message appears asking if you are sure you want to run diagnostics, press <Y>, and then press <Enter>.

   NOTE: The System Diagnostics program does not start until the power-on self test (POST) completes.

Navigating System Diagnostics

lists the basic keys used to view or change information in the screens and to exit the program. The keys used to navigate screens in the appliance differ, depending on the version of the operating system installed on your console redirection client system.

Because of ANSI limitations, not all keys can be used with console redirection. shows keystroke combinations used for the version of Windows on your client system.

Table 3-1. Diagnostics Navigation Keys

Keys	Action
<Shift> or <Tab>	Moves to the next field.
Up arrow	Moves to the previous field.
Space bar	Selects or deselects options on menus. Selected options display an asterisk.
<Enter>	Starts a test or displays submenus.
<Esc>	Cancels the current operation or returns to the previous menu. On the main menu, <Esc> exits the System Diagnostics program and reboots the system. For most of the options, any changes you make are recorded but do not take effect until you reboot the system. For a few options (as noted in the help area), the changes take effect immediately.

Table 3-2. Console Redirection Keys

Normal Keys (As They Appear on the Keyboard)	Keys Used for Windows 2000 Prior to Service Pack 2	Keys Used for All Other Windows Operating Systems
Home	<Esc><h>	<Esc><h>
End	<Esc><k>	<Esc><k>
Insert	<Esc><+>	<Esc><+>
Delete	<Esc><->	<Esc><->
Page Up	< Esc><?>	<Page Up>
Page Down	<Esc></>	<Page Down>
F1	<Esc><1>	<F1>
F2	<Esc><2>	<F2>
F3	<Esc><3>	<F3>
F4	<Esc><4>	<F4>
F5	<Esc><5>	<Esc><5>
F6	<Esc><6>	<Esc><6>
F7	<Esc><7>	<Esc><7>
F8	<Esc><8>	<Esc><8>
F9	<Esc><9>	<Esc><9>
F10	<Esc><0>	<Esc><0>
F11	<Esc><!>	<Esc><!>
F12	<Esc><@>	<Esc><@>
Up arrow	<Esc><w>	Up arrow
Right arrow	<Esc><a>	Right arrow
Left arrow	<Esc><d>	Left arrow
Down arrow	<Esc><x>	Down arrow

<Ctrl><Alt><Delete>	<Esc><Shift><r> <Esc><r> <Esc><Shift><r>	<Esc><Shift><r> <Esc><r> <Esc><Shift><r>
	OR	OR
	<Esc><Shift><b>	<Esc><Shift><b>

Diagnostic Test Types

The diagnostic test coverage are divided into the following categories: CPU, memory, system board, IDE hard drive, and network controller.

CPU

Select **Processor Tests** on the **System** menu for CPU tests. The tests ensure that the CPU functions properly. The processor tests include the following features:

- **Basic Functionality** — verifies that the CPU operates correctly and efficiently in all addressing modes. The test is performed in 16-bit real mode.

- **Speed** — determines and displays the CPU clock speed. The screen displays the expected processor speed and the actual CPU clock speed. CPU speed is determined by measuring the number of CPU clock cycles that occur in a known time period.

- **Protected Mode** — verifies the protected-mode instructions normally used by most modern operating systems for switching to protected mode.

- **Coprocessor** — checks the functionality of the math coprocessor. This test loads and stores the control and status word, checks data transfer between the CPU and the math coprocessor, and tests exception checking while the data transfer is in progress.

Memory

Memory tests, which report the size of system memory, write to all areas of installed DRAM system memory up to 2 GB. The System Diagnostics program isolates faulty memory modules and displays a message that identifies the location of the faulty memory.

Memory tests include:

- **BIOS ROM Test** — checks the data path of the BIOS ROM and makes sure the ROM is write protected.

- **Parity Test** — finds parity errors in all system memory. This test is the best way to identify and report data corruption because of DRAM system memory hardware problems. This test diagnoses the parity error detection circuitry in DRAM.

- **Pattern Tests** — includes test routines that write a series of test patterns to memory, then read the patterns back and compare the read results with the pattern that was written. The memory read and write instructions test all of DRAM. The following tests are subtests of the pattern test.

  - **Extended Pattern Test** includes the following two test routines that write data to memory, read the data back, and compare the data:

    Walking 1's Test uses the Walking 1's Left Test and the Walking 1's Right Test routines to identify shorts on data lines and data bits stuck at 1.

    Walking 0's Test writes shifting patterns to memory to find memory errors. This test uses two test routines to identify open data lines, the Walking 0's Left Test and the Walking 0's Right Test.

  - **Random Memory Test** — writes a random bit pattern to a randomly selected DRAM system memory location and reads the same memory location, looking for the same bit pattern that was written.

  - **Address Test** — checks for short and open circuits on address lines.

  - **Refresh Test** — checks the DRAM system memory refresh interval rate.

  - **Data Bus Test** — makes sure the data bus works properly.

- **External Cache Memory Test** — identifies and tests the external cache memory, and then performs a random pattern test within the range of the cache memory size to detect cache memory problems.

- **Quick Memory Test** — quickly verifies that the entire installed memory can be accessed.

System Board

- **DMA Controller Register Tests** — a series of read and write tests on the memory address registers and page registers of DMA controllers 1 and 2.

- **Interrupt Controller Test** — performs a series of read and write tests on interrupt mask registers and checks for stray interrupts after masking off all interrupts.

- **Timer Test** — checks the accuracy of the timer count by calibrating it against the periodic interrupt of the Real Time Clock (RTC).

- **Real Time Clock Test** — checks the regularity of the real time clock interrupt by calibrating it against the timer 0 interrupt.

- **CMOS Memory Validity Test** — checks the validity of the data in CMOS RAM and makes sure that the CMOS RAM checksums are correct. This test also ensures that the battery is in good condition.

- **SMBus Test** — checks that the System Management Bus (SMBus) works properly. This test consists of the SMBus general test and the SMB access test.

- **Hardware Monitoring Tests** — reads the values of the following items and checks whether they are in a specified range. This test monitors the following measurements:

  - System voltages (2.0-V, 2.5-V or 1.5-V, 5-V, and 12-V)

  - System fan speed

  - CPU temperature

IDE Hard Drive

- **Write Test** — checks that the selected IDE hard drive writes data correctly. It writes a pattern of data to the IDE hard drive, then reads the data it has written. It is a destructive test. This test destroys all data on the tested IDE hard drive. Initially, the destructive test is hidden. Select **Toggle Hidden Test Display** to display the test (Write Test) on the menu. Select **Toggle Hidden Test Display** again to hide the test.

NOTICE: The IDE HDD Write Test is a destructive and hidden test. When you run this test, it erases all data on the tested drives.

- **Read Test** — performs sequential and random read operations on the specified part of the IDE drive.

- **Verify Test** — performs sequential and random read and verify operations on the specified part of the IDE drive.

- **Seek Test** — determines the head movement ability of the hard drive over the specified cylinder and head range. It consists of a sequential seek test and random seek test.

- **Quick Test** — verifies that the software can fully access the selected IDE hard drive. The test reads small blocks of sectors at the beginning, middle, and end of the hard drive.

Network Controller

- **CSR Access Test** — checks access to the i8255x Control/Status Register through I/O and memory.

- **Walking Bits Test** — performs **Walking 1's Test** on all valid I/O registers.

- **Self Test** — checks the functionality of the i8255x micromachine, internal registers and internal ROM.

- **IRQ Test** — checks that an interrupt was assigned to the i8255x, and it then forces the controller to generate an IRQ to see if it is acknowledged properly.

- **MAC Address Test** — determines if the stored MAC address is valid.

- **Transmission Test** (loop back test) — determines if the i8255*x* controller is transmitting and receiving data properly. It requires two or more i8255*x* Ethernet controllers in the system to be connected through a hub or crossover cable.

  NOTE: Running this test without the crossover cable generates errors.

Selecting and Running Tests

Use the **Options** menu to select how to run tests. You can select individual tests on each menu by highlighting the test and pressing the space bar, or you can use the **Options** menu to select groups of tests.

- **Toggle All** — selects or deselects all of the tests in the System Diagnostics program.

- **Toggle All Tests in Menu** — selects or deselects all of the tests on a menu that you select, such as all of the tests on the **Memory** menu.

- **Toggle All Quick Tests** — selects or deselects tests classified as Quick Tests.

- **Run Selected Tests** — runs all tests that appear as selected on the menus. Selected tests have an asterisk to the left of them.

- **Toggle Hidden Tests** — displays or hides tests that are hidden by default, making them available for selection on the menu.

  NOTICE: The IDE HDD Write Test is a destructive and hidden test. When you run this test, it erases all data on the tested drives.

Logging Test Results

Use the **Options** menu to select how you want to report results. You can log test results ranging from detailed (such as all test names, time started, time ended, and error) to basic results that show only the error.

The error log identifies errors by an error code. See the **errorcodes.txt** file on your *Resource* CD for information about the codes.

Generating a Report

1. Run the diagnostics tests.

2. Select the **Options** menu, select **Generate Report**, and press <Enter>.

3. Select **Continue** and press **<Enter>.**

4. Select **Options**, select **Download Report**, and press <Enter>.

5. On the **Hyperterminal** window, select **Transfer**, and then select **Receive file**.

6. Enter the location where you want to save the report, select **Xmodem** as the protocol, and then click **Receive**.

7. Enter the filename of the report, using the extension of your text editor, such as **test1.txt**, and click **OK**.

8. Open the text file to view the report.

Clearing the Test Log

The report includes information for the entire test log, which contains all tests that you have run. To clear the test log, select the **Options** menu, select **Clear Report**, and press <Enter>. The test log clears, and the next test report shows only results from tests run since you cleared the log.

LED Indicators

Two LED indicators show the test status. When the diagnostics are running, the LEDs display green or amber as follows:

- When you run a test, the power LED blinks amber.

- When a test fails, the warning LED lights amber.

Troubleshooting Your System

Dell™ PowerVault™ 715N Systems Installation and Troubleshooting Guide

If your system is not working as expected, begin troubleshooting using the procedures in this section. This section guides you through initial checks and procedures that can solve basic system problems and provides troubleshooting procedures for components inside the system. Before you start any of the procedures in this section, perform the following steps:

- Read the "Safety Instructions" in your *System Information* document.

- Read "Running System Diagnostics" for information about running diagnostics.

NOTE: To perform the troubleshooting tasks, you can use the console redirection function on the serial port (COM1). See the *System Administrator's Guide* for more information about console redirection.

Safety First—For You and Your System

The procedures in this guide require that you remove the cover and work inside the system. While working inside the system, do not attempt to service the system except as explained in this guide and elsewhere in Dell documentation. Always follow the instructions closely. Make sure to review all of the procedures in "Safety Instructions" in your *System Information* document.

Working inside the system is safe—if you observe the following precautions.

⚠ **CAUTION: The power supplies in this system produce high voltages and energy hazards, which can cause bodily harm. Only trained service technicians are authorized to remove the system cover and access any of the components inside the system.**

⚠ **CAUTION: See "Protecting Against Electrostatic Discharge" in the Safety Instructions in your *System Information* document before performing any procedure that requires you to open the cover.**

External Connections

Improperly set switches, controls, and loose or improperly connected cables are the most likely source of problems for the system or any peripherals. A quick check of all the switches, controls, and cable connections can easily solve these problems. See your *User's Guide* for the back-panel features and connectors.

Checking Specific System Problems

1. Turn off the system, including any attached peripherals. Disconnect all the power cables from their electrical outlets.

2. If the system is connected to a power distribution unit (PDU), turn the PDU off and then on again.

   If the system is not receiving power, plug it into another electrical outlet. If it still is not receiving power, try another PDU.

3. Reconnect the system to the electrical outlet or PDU.

Startup Routine

Looking at and listening to the system is important in determining the source of a problem. Look and listen during the system's startup routine for the indication described in Table 4-1.

Table 4-1. Startup Routine Indications

Look and Listen for:	Action
An error message	See "Indicators, Messages, and Codes."
The hard drive activity indicators	See "Troubleshooting Hard Drives."
A series of beeps	See "Indicators, Messages, and Codes."
An unfamiliar constant scraping or grinding sound when you access a hard drive	See "Getting Help" for information about obtaining technical assistance from Dell.

Removing and Replacing the Front Bezel

Removing the front bezel provides access to the hard drives. To remove the bezel, push the levers on the outside inward and pull the bezel away from the system (see Figure 4-1).

Figure 4-1. Removing the Front Bezel
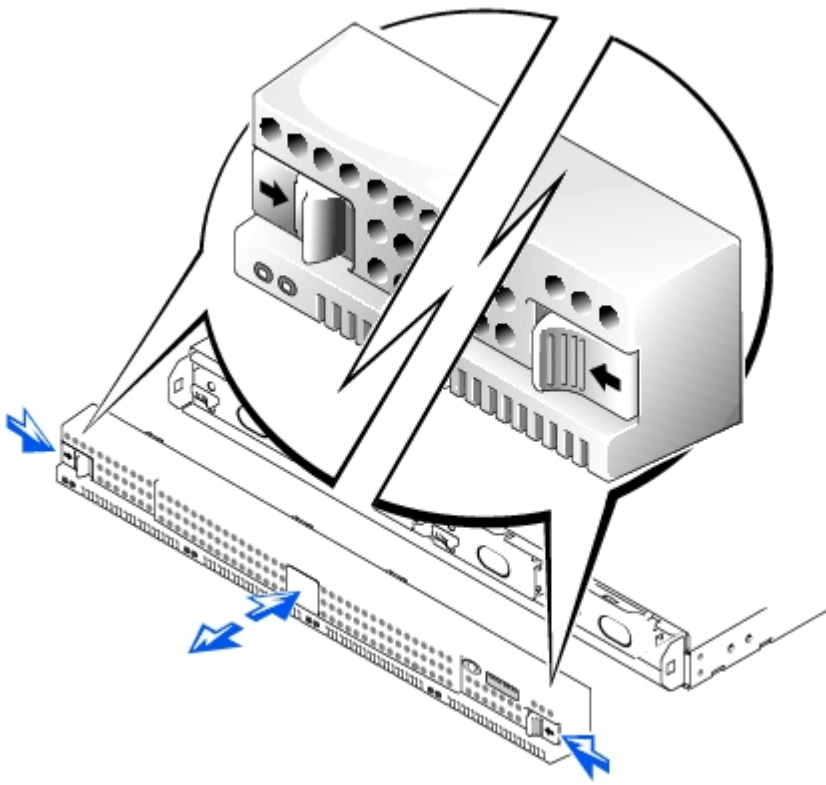
To replace the bezel, push the levers inward and push the bezel onto the front of the system.

Removing and Replacing the System Cover

The system is enclosed by a front bezel and a cover. To upgrade or troubleshoot the system, remove the system cover to gain access to internal components.

Removing the System Cover

1. Observe the precautions in "Safety First—For You and Your System."

2. Push the latches on the top of the system inward (see Figure 4-2).

3. Slide the system cover backward about an inch, and grasp the cover on both sides.

4. Carefully lift the cover away from the system.

Figure 4-2. Removing the System Cover
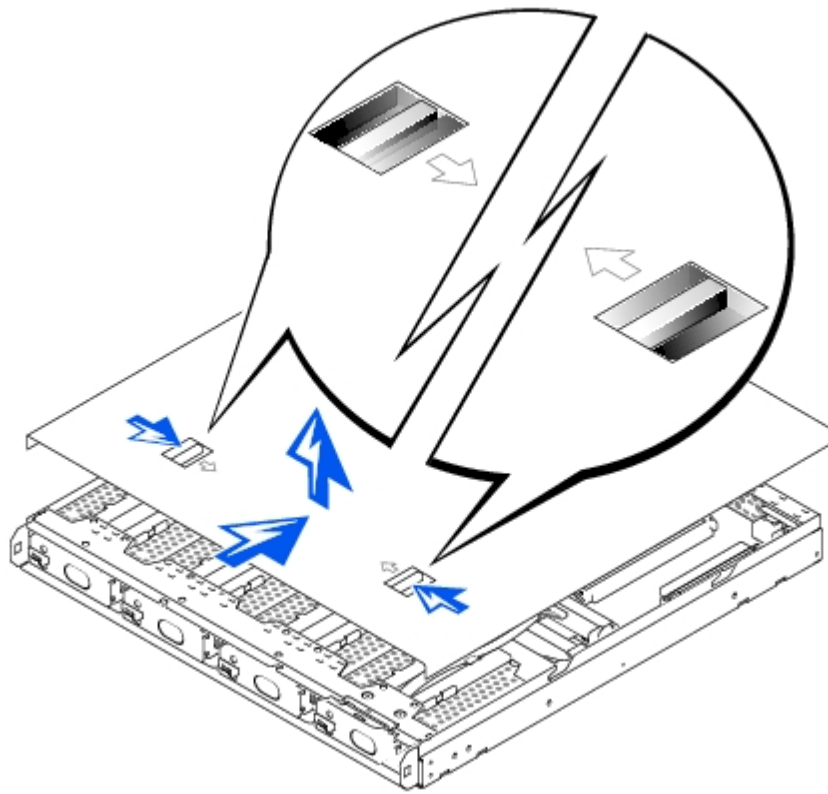
Replacing the System Cover

1. Ensure that you did not leave tools or parts inside the system.

2. Fit the cover over the sides of the chassis, and slide the cover forward until it snaps into place.

Checking the Equipment

This section provides troubleshooting procedures for equipment that connects directly to the I/O panel of the system. Before you perform any of the procedures, see "External Connections."

Troubleshooting the Serial Port

Problem

- You cannot access the appliance through console redirection.

Action

1. Turn off the appliance.

2. Using a slim, pointed object, push the console redirection reset button, which is located on the rear of the system board near the Ethernet ports (see Figure 4-3).

3. While still holding down the console redirection reset button, push the power button to turn on the appliance, and then release the console redirection reset button.

   ✏️ **NOTE:** The system does not turn on until you release the console redirection reset button.
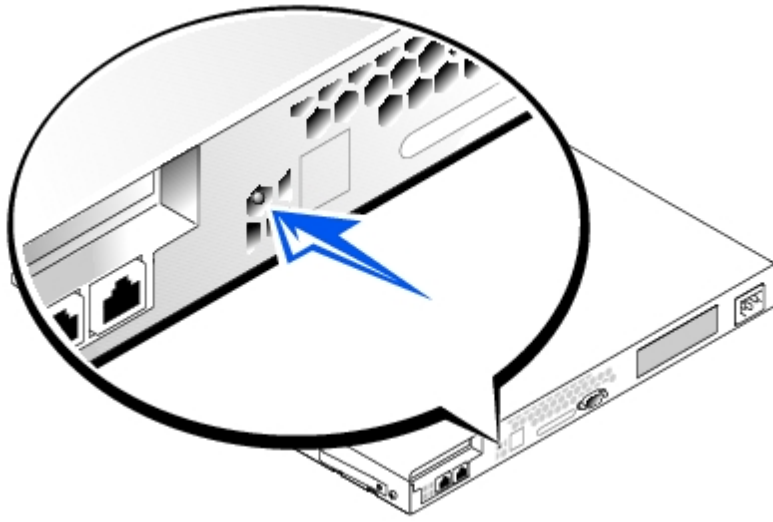
Figure 4-3. Console Redirection Reset Button

4. If the problem is not resolved, turn off the system and any device connected to the serial port.

5. Ensure that you use a null modem serial cable.

6. Swap the cable with a known working cable.

7. Turn the client system on, and then turn on the appliance.

   If the problem is resolved, the interface cable must be replaced. See "Getting Help" for information about obtaining technical assistance.

Troubleshooting the Integrated NIC

NOTE: Parts of this procedure require you to use the console redirection function on the serial port. See your Administrator's Guide for information about connecting to the system through console redirection.

Problem

- NIC cannot communicate with the network.

Action

NOTE: The system takes approximately 5 minutes to fully boot. Ensure that the system has had adequate time to boot before performing any troubleshooting procedures.

1. Ensure that you use an Ethernet cable and not the crossover cable that came with your system.

2. Enter the BIOS Setup utility and confirm that the NIC is enabled.

   See "Using the BIOS Setup Utility" in the *User's Guide* for instructions.

3. Check the two indicators on the left and right corners of the NIC connector on the system's back panel (see Figure 4-4).

   The green link indicator shows that the adapter is connected to a valid link partner. The amber activity indicator lights if the system sends or receives network data.

   - If the link indicator is not on, check all cable connections.

   - Change the auto-negotiation setting, if possible.

   - Try another port on the switch or hub.

4. If the activity indicator does not light, the network driver files might be damaged or deleted.

Figure 4-4. NIC Indicators

activity indicator — link indicator
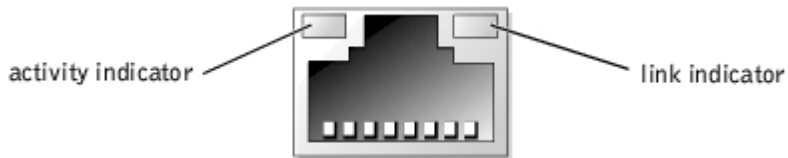
Inside the System

In Figure 4-5, the system cover and front bezel are removed to provide an interior view of the system.

Figure 4-5. Inside the System

power supply
fan assembly
microprocessor and heat sink
memory modules
hard drives (4)
PCI card connector
backplane board
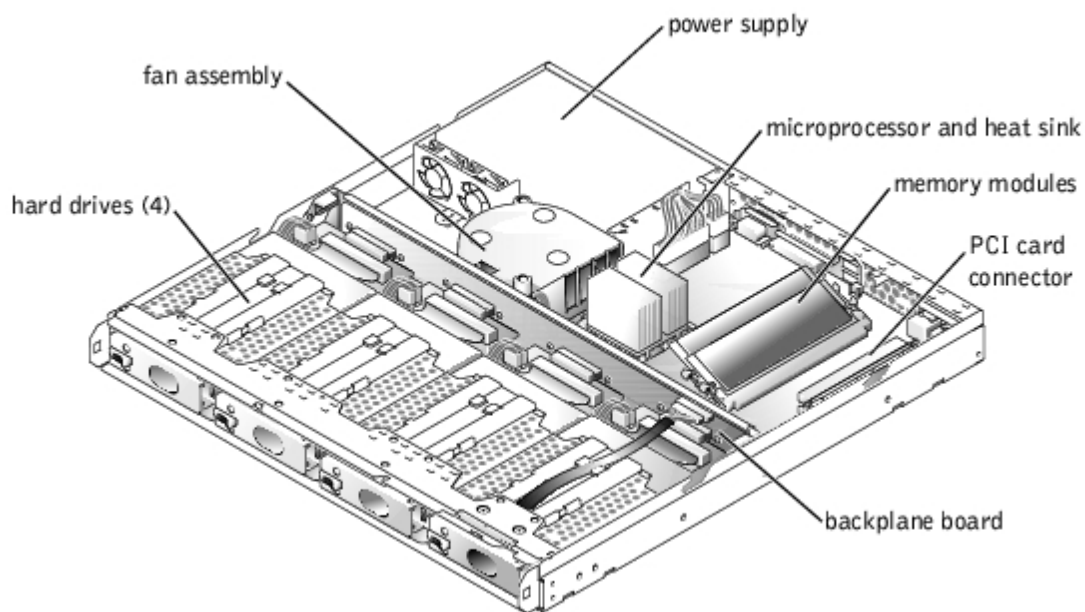
The system board holds the system's control circuitry and other electronic components. Several hardware options such as the microprocessors and memory are installed directly on the system board. The system board can accommodate one PCI expansion card.

The hard drive bays provide space for up to four drives. Power is supplied to the backplane board, the system board, and internal peripherals through a power supply.

Troubleshooting a Wet System

Problem

- Liquid spills.

- Splashes.

- Excessive humidity.

Action

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

2. Remove the system cover.

3. Remove the expansion card, if installed.

4. Allow the system to dry thoroughly for at least 24 hours.

5. Replace the system cover, reconnect the system to the electrical outlet, and turn on the system.

   If the system does not start up properly, see "Getting Help" for information about obtaining technical assistance.

6. If the system starts up normally, shut down the system and reinstall all the expansion cards you removed in step 3.

7. Run the system board tests in the System Diagnostics to confirm that the system works properly.

   If the tests did not complete successfully, see "Getting Help" for information about obtaining technical assistance.

Troubleshooting a Damaged System

NOTE: Parts of this procedure require you to use the console redirection function on the serial port. See your *System Administrator's Guide* for information about connecting to the system through console redirection.

Problem

- System dropped or damaged.

Action

1. Check the following connections:

   - Expansion-card connections to the system board

   - Drive-carrier connections to the backplane board

2. Ensure that all cables are properly connected and all components are properly seated in their connectors and sockets.

3. Run the system board tests in the System Diagnostics.

   If the tests did not complete successfully, see "Getting Help" for information about obtaining technical assistance.

Troubleshooting the System Battery

Problem

- Error message shows problem with the battery.

- BIOS Setup utility loses the system configuration information.

- System date and time do not stay current.

Action

1. Check the connection of the battery to the system board.

   See "Replacing the System Battery" in "Installing System Board Options."

   CAUTION: There is a danger of a new battery exploding if it is incorrectly installed. Replace the battery

⚠️ **only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.**

2. If the problem is not resolved by reseating the battery, replace the battery.

   If the problem is not resolved by replacing the battery, see "Getting Help" for information about obtaining technical assistance.

Troubleshooting the Power Supply

Problem

- The power LED on the front of the system is not lit.

Action

1. Check the connection of the power cable to the power supply and the outlet.

2. Turn on the system.

3. If the problem is not resolved, check the power source.

4. If the problem is still not resolved, replace the power supply.

   See "Getting Help" for information about obtaining technical assistance.

Troubleshooting the Cooling Fan

Problem

- The fan does not work.

Action

1. Turn off the system and disconnect the system from its electrical outlet.

2. Remove the system cover.

3. Locate the fan and lift it from the chassis.

   See "Removing and Replacing the Fan Assembly" in "Installing System Board Options" for information about removing the fan.

4. Reseat the fan.

   Ensure that the fan connector is firmly seated.

5. Install the system cover.

6. Connect the system to an electrical outlet, and turn on the system.

   If the problem is resolved, you are finished with this procedure.

   If the problem still exists, continue to step 7.

7. Turn off the system and disconnect the system from its electrical outlet.

8. Remove the system cover.

9. Locate the fan and lift it from the chassis.

10. Insert a replacement cooling fan.

11. If the replacement fan does not operate, one of the fan connectors is faulty.

See "Getting Help" for information about obtaining technical assistance.

Troubleshooting an Expansion Card

![icon] **NOTE:** Parts of this procedure require you to use the console redirection function on the serial port. See your *System Administrator's Guide* for information about connecting to the system through console redirection.

Problem

- Expansion card seems to perform incorrectly or not at all.

Action

1. Turn off the system and disconnect the system from its electrical outlet.

2. Remove the system cover.

3. Verify that the expansion card is firmly seated in its connector and the riser card is firmly seated in the riser-card connector.

4. Verify that any appropriate cables are firmly connected to the corresponding connector on the expansion card.

5. Install the system cover.

6. Connect the system to an electrical outlet and turn on the system.

   If the problem is resolved, your are finished with this procedure.

   If the problem still exists, continue to step 7.

7. Turn off the system and disconnect the system from its electrical outlet.

8. Remove the system cover.

9. Remove the expansion card.

10. Install the system cover.

11. Connect the system to an electrical outlet and turn on the system.

12. Run the system memory tests in the System Diagnostics.

   If the tests do not complete successfully, see "Getting Help" for information about obtaining technical assistance.

13. Reinstall the expansion card.

14. Turn on the system and repeat step 12.

   If the system memory tests still fail, see "Getting Help" for information about obtaining technical assistance.

Troubleshooting System Memory

Problem

- Faulty memory module.

- Faulty system board.

Action

1. Turn on the power to the system, including any attached peripherals.

2. Enter the BIOS Setup utility to check the system memory setting.

   See "Using the BIOS Setup Utility," in the *User's Guide* for instructions.

3. If the amount of memory installed matches the system memory setting, go to step 16.

4. If the amount of memory installed does not match the system memory setting, turn off the system, including any attached peripherals, and disconnect the system from its electrical outlet.

⚠ **CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions in your *System Information* document.**

5. Remove the system cover.

6. Reseat the memory modules in their sockets.

7. Replace the system cover, reconnect the system to the power source, and turn on the system.

8. Enter the BIOS Setup utility and check the system memory again.

9. If the amount of memory installed still does not match the system memory setting, turn off the system, including any attached peripherals, and disconnect the system from its electrical outlet.

10. Remove the system cover.

11. Swap the memory modules with two of the same capacity.

12. Replace the system cover and reconnect the system to an electrical outlet.

13. Turn on the power to the system, including any attached peripherals.

14. Enter the BIOS Setup utility to check the system memory setting.

    See "Using the BIOS Setup Utility," in the *User's Guide* for instructions.

    If the amount of memory installed matches the system memory setting, you are finished with this procedure.

    If the amount of memory installed still does not match the system memory setting, continue to the next step.

15. Run the system memory test in the System Diagnostics.

    If the test does not complete successfully, see "Getting Help" for information about obtaining technical assistance.

Troubleshooting the System Board

Problem

- Error message indicates a system board problem.

Action

1. Turn off the system, including any attached peripherals, and disconnect the system from its electrical outlet.

2. Remove the front bezel.

   See "Removing and Replacing the Front Bezel."

3. Remove the system cover.

   See "Removing and Replacing the System Cover."

4. Remove the expansion card, if installed.

5. Replace the system cover, reconnect the system to the power source, and turn on the system.

6. Run the system board tests in the System Diagnostics.

   If the tests do not run successfully, see "Getting Help" for information about obtaining technical assistance.

7. Turn off the system, disconnect it from the power source, and remove the system cover.

8. Reinstall the expansion card.

9. Replace the system cover, reconnect the system to the power source, and turn on the system.

10. Run the system board tests again.

    If the tests do not complete successfully, see "Getting Help" for information about obtaining technical assistance.

Troubleshooting Hard Drives

Problem

- The drive fails.

Action

⚠️ **CAUTION: This troubleshooting procedure can destroy data stored on the hard drive. Before you proceed, back up all the files on the hard drive.**

1. Turn off the system.

2. Remove the drive carrier and install it in another drive bay.

   See "Installing Hard Drives" for information about installing hard drives.

3. If the problem is resolved, the backplane board has a defective connector.

   See "Getting Help" for information about obtaining technical assistance.

4. If the problem is not resolved, see "Getting Help" for information about obtaining technical assistance.

Installing System Board Options

Dell™ PowerVault™ 715N Systems Installation and Troubleshooting Guide

- Removing and Replacing the Fan Assembly
- Expansion Card
- Adding Memory
- Microprocessor Upgrades
- Replacing the System Battery

This section describes how to install the following options:

- Fan assembly
- Expansion card
- Memory upgrades
- Microprocessor upgrades
- System battery

Use Figure 5-1 to locate the system board features.

> ⚠️ **CAUTION: Before you perform this procedure, you must turn off the system and disconnect it from its power source. For more information, see "Safety First—For You and Your System" in "Troubleshooting Your System."**

Figure 5-1. System Board Features
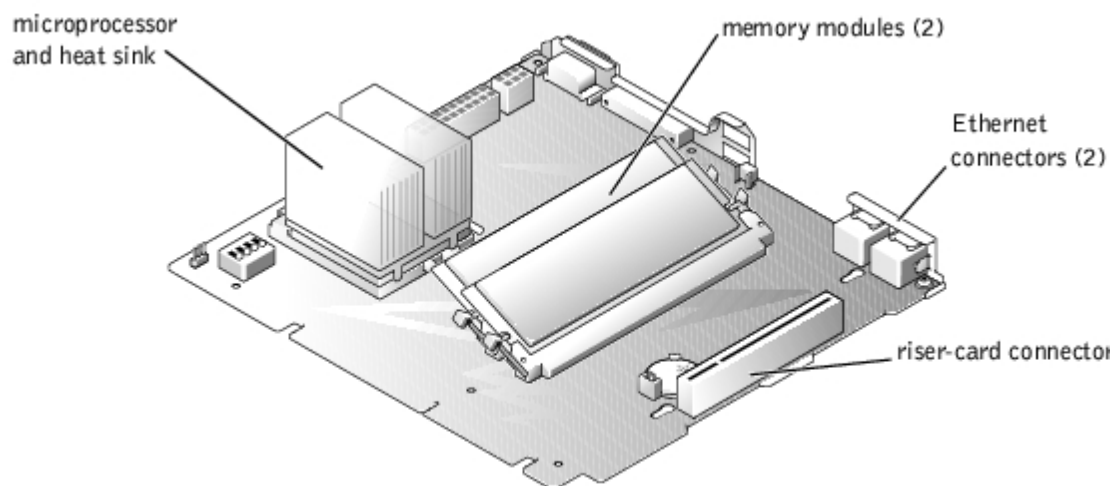
Removing and Replacing the Fan Assembly

The fan assembly, which is located behind IDE hard drive 1, contains one fan.

Removing the Fan Assembly

1. Turn off the system.

2. Remove the system cover.

3. Lift the fan out of the chassis carefully, making sure that the connector disconnects from the system board (see

Figure 5-2. Removing the Fan Assembly
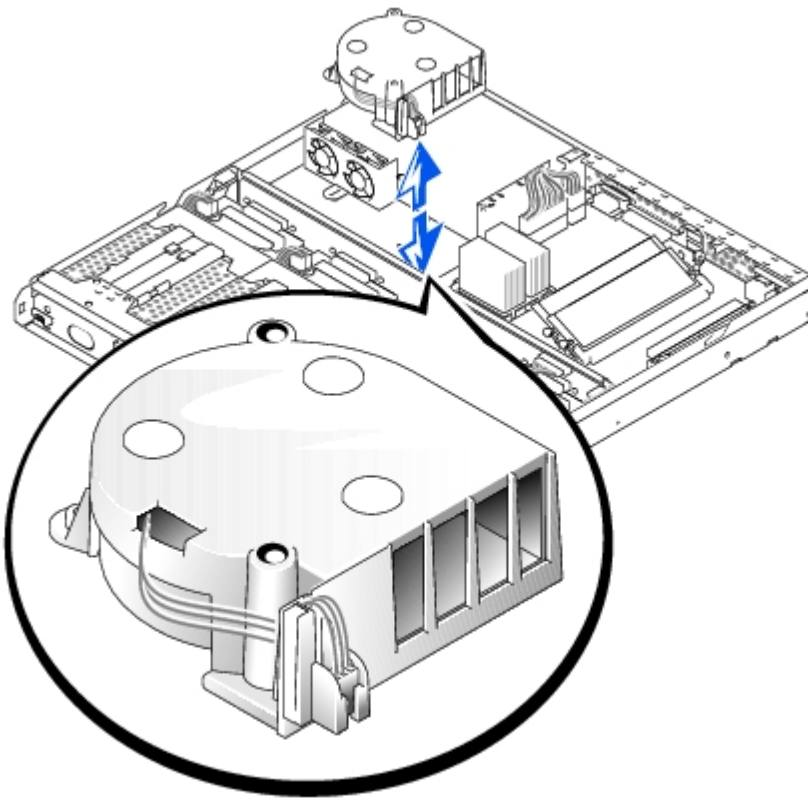
Replacing the Fan Assembly

1. Align the fan assembly with its connector on the system board and the peg on the chassis.

2. Push down on the fan assembly until it is connected to the system board.

3. Replace the system cover.

4. Turn on the system.

Expansion Card

The system has capacity for one, low-profile PCI expansion card. You install the card by using a riser card (see Figure 5-3).

Installing an Expansion Card

To install an expansion card, perform the following steps.

⚠ **CAUTION: Before you perform this procedure, you must turn off the system and disconnect it from its power source. For more information, see "Safety First—For You and Your System" in "Troubleshooting Your System."**

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

2. Remove the cover (see "Removing and Replacing the System Cover" in "Troubleshooting Your System").

⚠️ **CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions in your *System Information* document.**

3. Open the expansion-card latch and remove the filler bracket.

   📝 **NOTE:** Keep this bracket in case you need to remove the expansion card. Installing a filler bracket over an empty expansion slot is necessary to maintain Federal Communications Commission (FCC) certification of the system. The brackets also keep dust and dirt out of the system and aid in proper cooling and airflow inside the system.

4. Without removing the riser card, insert the card firmly into the expansion-card connector on the riser card until the card is fully seated (see Figure 5-3).

5. Close the expansion-card latch (see Figure 5-3).

Figure 5-3. Installing the Expansion Card

6. Connect any cables that should be attached to the card.

7. Replace the system cover, and then reconnect the system and peripherals to the power source and turn on the system.

Removing an Expansion Card

⚠️ **CAUTION: Before you perform this procedure, you must turn off the system and disconnect it from its power source. For more information, see "Safety First—For You and Your System" in "Troubleshooting Your System."**

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

2. Remove the cover.

   See "Removing and Replacing the System Cover" in "Troubleshooting Your System."

3. Disconnect any cables connected to the expansion card.

4. Rotate the expansion-card latch away from the expansion card to release the card.

5. Grasp the expansion card and carefully pull it away from the riser-card connector.

6. If you are removing the card permanently, install a metal filler bracket over the empty card-slot opening.

   ✏ **NOTE:** Installing a filler bracket over an empty expansion slot is necessary to maintain Federal Communications Commission (FCC) certification of the system. The brackets also keep dust and dirt out of the system and aid in proper cooling and airflow inside the system.

7. Rotate the expansion card latch to the closed position.

8. Replace the system cover, and then reconnect the system and peripherals to the power source and turn on the system.

Adding Memory

The two memory module sockets on the system board can accommodate a minimum of 128 MB of registered SDRAM. The memory module sockets are located near the back edge of the system board (see Figure 5-1), behind hard drive 2.

Memory Upgrade Kits

You can upgrade the system by installing combinations of registered memory modules. If you receive an error message stating that maximum memory has been exceeded, see "Indicators, Messages, and Codes" for more information. You can purchase memory upgrade kits from Dell.

✏ **NOTE:** The memory modules must be PC-133 compliant.

Memory Module Installation Guidelines

✏ **NOTE:** Parts of this procedure require you to use the console redirection function on the serial port. See your System Administrator's Guide for information about connecting to the system through console redirection.

Performing a Memory Upgrade

⚠ **CAUTION: Before you perform this procedure, you must turn off the system and disconnect it from its power source. For more information, see "Safety First—For You and Your System" in "Troubleshooting Your System."**

⚠ **CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions in your *System Information* document.**
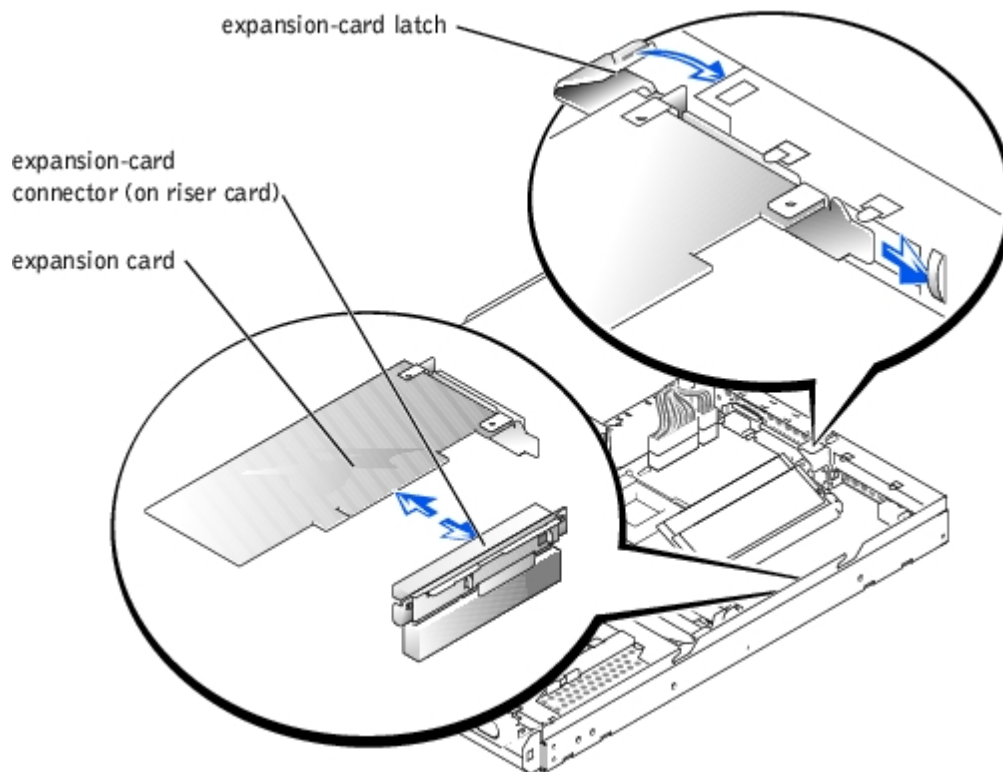
1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

2. Remove the cover.

   See "Removing and Replacing the System Cover" in "Troubleshooting Your System."

3. Locate the memory module sockets in which you want to install or replace memory module pairs.

   Figure 5-1 shows the location of the memory module sockets.

4. Install or replace the memory module(s) as necessary to reach the desired memory total (see "Installing Memory Modules" or "Removing Memory Modules").

5. Replace the system cover, reconnect the system to the electrical outlet, and turn on system.

6. (Optional) Press <F2> to enter the BIOS Setup utility, and check the **Extd Memory** setting on the **Standard CMOS Setup** screen. The system should have already changed the value in the **Extd Memory** setting to reflect the newly installed memory.

> ![note icon] **NOTE:** If you use a version of Microsoft® Windows® 2000 earlier than Service Pack 2, the function keys do not work. You must press <Esc><2>.

7. If the **Extd Memory** value is incorrect, one or more of the memory modules might not be installed properly. Repeat step 2 through step 5, checking to make sure that the memory modules are firmly seated in their sockets.

8. Run the system memory test in the System Diagnostics.

9. Close the front bezel.

Installing Memory Modules

> ⚠ **CAUTION: Before you perform this procedure, you must turn off the system and disconnect it from its power source. For more information, see "Safety First—For You and Your System" in "Troubleshooting Your System."**

> ⚠ **CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions in your *System Information* document.**

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

2. Remove the cover (see "Removing and Replacing the System Cover" in "Troubleshooting Your System").

3. Locate the memory module sockets in which you want to install or replace the memory module(s).

   Figure 5-1 shows the location of the memory module sockets.

4. Press down and outward on the ejectors on the memory module socket, as shown in Figure 5-4, to allow the memory module to be inserted into the socket.

Figure 5-4. Installing and Removing a Memory Module

alignment keys (2)

memory module socket ejectors (2)
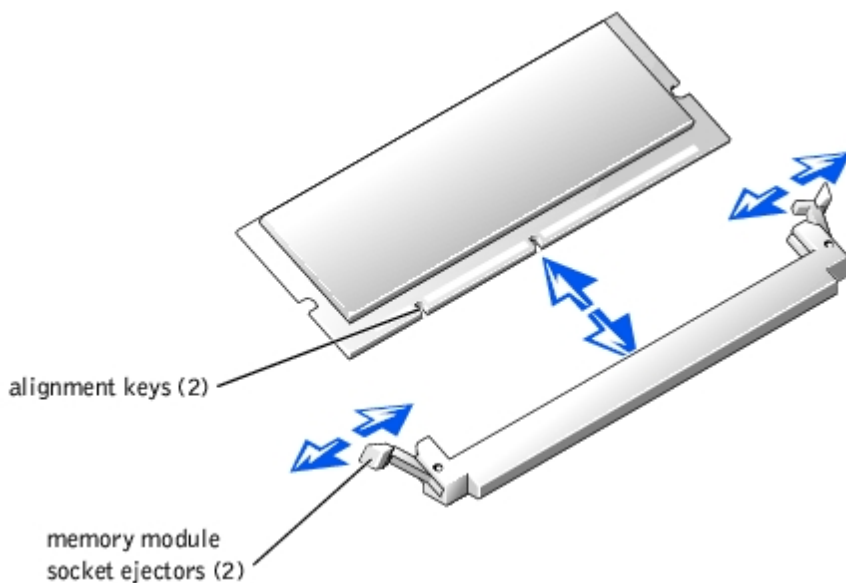
5. Align the memory module's edge connector with the alignment keys of the memory module socket, and insert the memory module in the socket (see Figure 5-4).

   The memory module socket has two alignment keys that allow you to install the memory module in the socket in only one way.

6. Press down on the memory module with your thumbs while pulling up on the ejectors with your index fingers to lock the memory module into the socket (see Figure 5-4).

   When the memory module is properly seated in the socket, the ejectors on the memory module socket align with the ejectors on the other sockets with memory modules installed.

7. Repeat step 4 through step 6 of this procedure to install the remaining memory modules.

8. Perform step 5 through step 9 of "Performing a Memory Upgrade."

Removing Memory Modules

⚠️ **CAUTION: Before you perform this procedure, you must turn off the system and disconnect it from its power source. For more information, see "Safety First—For You and Your System" in "Troubleshooting Your System."**

⚠️ **CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions in your *System Information* document.**

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

2. Remove the cover.

   See "Removing and Replacing the System Cover" in "Troubleshooting Your System."

3. Locate the memory module sockets in which you want to remove memory modules.

   Figure 5-1 shows the location of the memory module sockets.

4. Press down and outward on the ejectors on each end of the socket until the memory module pops out of the socket (see Figure 5-4).

Microprocessor Upgrades

To take advantage of future options in speed and functionality, you can replace the processor.

Each processor and its associated Level 2 (L2) cache memory are contained in a pin grid array (PGA) package that is installed in a ZIF socket on the system board. The following subsection describes how to install or replace the microprocessor.

Replacing a Microprocessor

The following items are included in the microprocessor upgrade kit:

- A microprocessor
- A heat sink
- A securing clip

📝 **NOTE:** Dell recommends that only a technically knowledgeable person should perform this procedure.

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

2. Remove the cover.

   See "Removing and Replacing the System Cover" in "Troubleshooting Your System."

⚠️ **CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions in your System Information document.**

3. Press down on the heat-sink securing clip to release the clip from the retaining tab on the ZIF socket (see Figure 5-5).

4. Remove the securing clip.

⚠️ **CAUTION: Never remove the heat sink from a microprocessor unless you intend to remove the**

microprocessor. The heat sink is necessary to maintain proper thermal conditions.

⚠️ **CAUTION: The microprocessor and heat sink can become extremely hot. Be sure the microprocessor has had sufficient time to cool before handling.**

Figure 5-5. Securing Clip
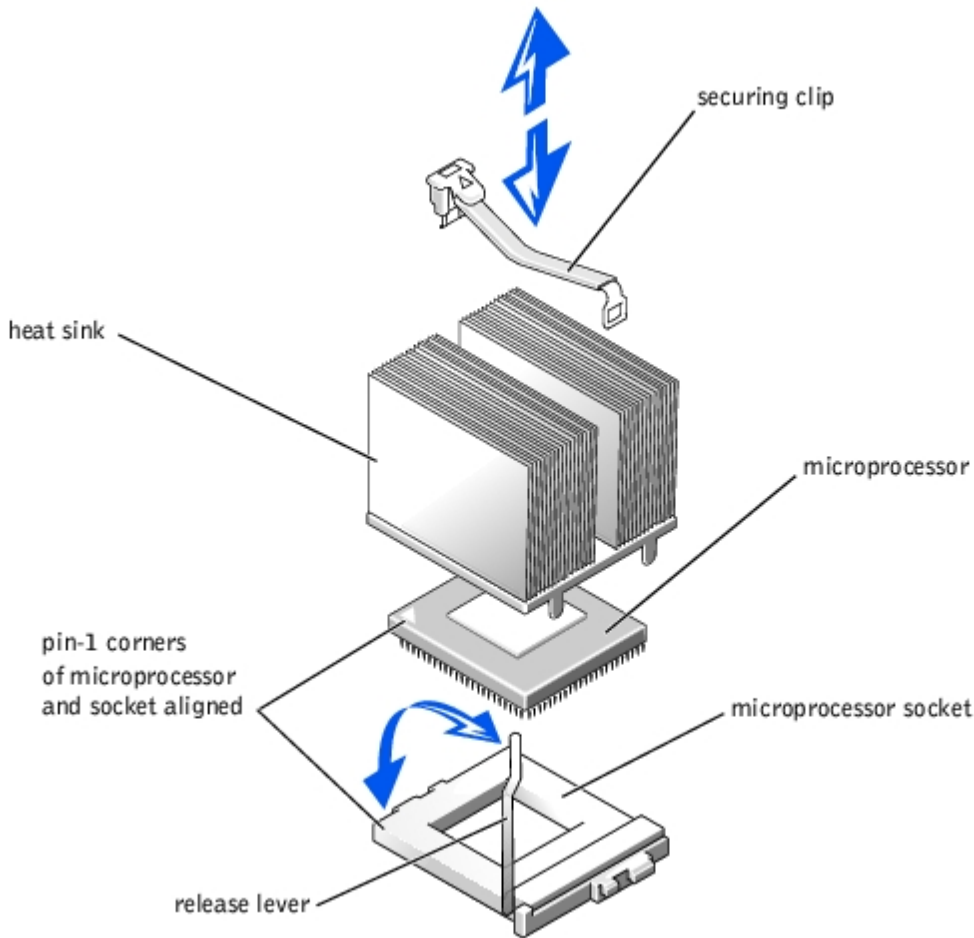
5. Remove the heat sink.

6. Pull the socket release lever straight up until the microprocessor is released (see Figure 5-5).

7. Lift the microprocessor out of the socket and leave the release lever up so that the socket is ready for the new microprocessor.

⊖ **NOTICE:** Be careful not to bend any of the pins when removing the microprocessor. Bending the pins can permanently damage the microprocessor.

8. Unpack the new microprocessor.

   If any of the pins on the microprocessor appear bent, see "Getting Help" for information about obtaining technical assistance from Dell.

9. Align the pin-1 corner of the microprocessor with the pin-1 corner of the microprocessor socket (see Figure 5-5).

   📝 **NOTE:** Identifying the pin-1 corners is critical to positioning the microprocessor correctly.

   Identify the pin-1 corner of the microprocessor by locating the tiny gold triangle that extends from one corner of the large central rectangular area. The gold triangle points toward pin 1, which is also uniquely identified by a square pad.

10. Install the microprocessor in the socket (see Figure 5-5).

⊖ **NOTICE:** Positioning the microprocessor incorrectly can permanently damage the microprocessor and the system

when you turn on the system. When placing the microprocessor in the socket, be sure that all of the pins on the microprocessor enter the corresponding holes. Be careful not to bend the pins.

If the release lever on the microprocessor socket is not positioned all the way up, move it to that position.

With the pin-1 corners of the microprocessor and socket aligned, set the microprocessor lightly in the socket and make sure all pins are matched with the correct holes in the socket. Because the system uses a ZIF micro-processor socket, do not use force, which could bend the pins if the microprocessor is misaligned. When the microprocessor is positioned correctly, it drops down into the socket with minimal pressure.

When the microprocessor is fully seated in the socket, rotate the socket release lever back down until it snaps into place, securing the microprocessor.

11. Place the new heat sink on top of the microprocessor (see Figure 5-5).

12. Orient the securing clip as shown in Figure 5-5.

13. Hook the end of the clip without the heat-sink latch to the tab on the edge of the socket facing the front of the system.

14. Push down and pivot the heat-sink latch until the hole on the clip latches onto the ZIF socket tab.

15. Make sure that the latches engage.

16. Replace the system cover.

17. Reconnect the system and peripherals to the power source, and turn on the system.

18. Press <F2> to enter the BIOS Setup utility, and check that the processor information matches the new system configuration.

   NOTE: If you use a version of Windows 2000 earlier than Service Pack 2, the function keys do not work. You must press <Esc><2>.

   See the system *User's Guide* for instructions.

19. As the system boots, it detects the presence of the new processor and automatically changes the system configuration information in the BIOS Setup utility.

20. Enter the BIOS Setup utility, and confirm that the top line in the system data area correctly identifies the installed processor(s).

   See "Using the BIOS Setup Utility" in your *User's Guide*.

21. Run the System Diagnostics to verify that the new microprocessor operates correctly.

   See "Running System Diagnostics" for information about running the diagnostics and troubleshooting any problems that might occur.

Replacing the System Battery

NOTE: Parts of this procedure require you to use the console redirection function on the serial port. See your *System Administrator's Guide* for information about connecting to the system through console redirection.

The system battery maintains system configuration, date, and time information in a special section of memory when you turn off the system. The operating life of the battery ranges from 2 to 5 years, depending on how you use the system (for example, if you keep the system turned on most of the time, the battery gets little use and, thus, lasts longer).

You might need to replace the battery if an incorrect time or date displays during the boot routine along with a message about wrong time, invalid configuration information, or bad CMOS checksum.

To determine if you need to replace the battery:

1. Re-enter the time and date through the BIOS Setup utility.

2. Turn off and disconnect the system from the electrical outlet for a few hours.

3. Reconnect and turn the system on again.

4. Enter the BIOS Setup utility.

   If the date and time are not correct in the BIOS Setup utility, replace the battery.

📝 **NOTE:** Some software might cause the system time to speed up or slow down. If the system seems to operate normally except for the time kept in the BIOS Setup utility, the problem might be caused by software rather than by a defective battery.

📝 **NOTE:** If the system is turned off for long periods of time (for weeks or months), the SDRAM might lose its system configuration information. This situation is not caused by a defective battery.

You can operate the system without a battery; however, the system configuration information maintained by the battery in SDRAM is erased each time you shut down the system. Therefore, you must re-enter the system configuration information and reset the options each time the system boots until you replace the battery. The battery is a 3.0-volt (V) battery.

To remove the battery, perform the following steps.

⚠️ **CAUTION: Before you perform this procedure, you must turn off the system and disconnect it from its power source. For more information, see "Safety First—For You and Your System" in "Troubleshooting Your System."**

⚠️ **CAUTION: There is a danger of a new battery exploding if it is incorrectly installed. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.**

1. Enter the BIOS Setup utility and, if possible, make a printed copy of the BIOS Setup screens.

   See "Using the BIOS Setup Utility," in the *User's Guide* for instructions.

2. Shut down the system, including any attached peripherals, and disconnect the system from the electrical outlet.

⚠️ **CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions in your *System Information* document.**

3. Remove the system cover.

4. Locate the battery (see Figure 5-1 for the battery location).

5. Pull the tab back on the battery socket and remove the battery out of its socket with your fingers.

6. Pull the tab back on the battery socket and place the new battery with the side labeled "+" facing up (see Figure 5-6).

Figure 5-6. Installing the Battery
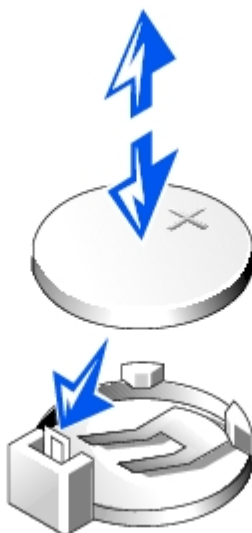
7. Replace the system cover, and then reconnect the system and peripherals to the power source and turn on the system power.

8. Enter the BIOS Setup utility to confirm that the battery operates properly.

9. Enter the correct time and date through the BIOS Setup utility's **Standard CMOS Setup** settings.

   Also, re-enter any system configuration information that is no longer displayed on the BIOS Setup screens, and then exit the BIOS Setup utility.

10. To test the newly installed battery, shut down and disconnect the system from the power source for at least an hour.

11. After an hour, connect the system to a power source and turn on the power.

12. Enter the BIOS Setup utility and if the time and date are still incorrect, see "Getting Help" for information about obtaining technical assistance.

Installing Hard Drives
Dell™ PowerVault™ 715N Systems Installation and Troubleshooting Guide

- Removing and Installing a Hard Drive
- Reinstalling the System

Your system comes with four IDE hard drives. The drives are not hot swappable.

Removing and Installing a Hard Drive

1. Remove the front bezel.

2. Push the release lever to the right (see Figure 6-1).

Figure 6-1. Releasing the Drive Latch
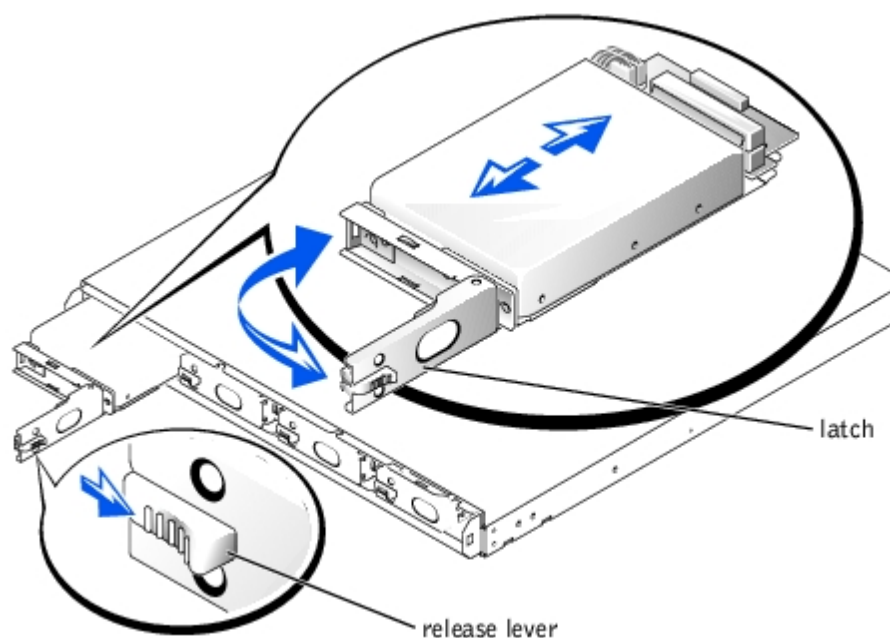
3. Pull open the latch and use it to pull the drive carrier out of the drive bay (see Figure 6-1).

4. Remove the screws on the bottom of the carrier and remove the drive from the carrier.

5. Disconnect the drive carrier's power and IDE cables from the drive.

6. Connect the power and IDE cables to the new drive.

7. Attach the drive to the carrier with the screws you removed.

8. Insert the carrier, with the latch partially opened, into the system.

9. Push the carrier into the bay until it is fully seated with a connection to the backplane board.

10. Close the latch.

11. Replace the bezel.

Reinstalling the System

Because your NAS appliance is designed to have redundancy, it can recover from certain hardware and software failures. In some situations, it can automatically recover, and in others, you must have administrator privileges and manually intervene to recover the appliance.

See your *System Administrator's Guide* for information about system reinstallation.

Getting Help

Dell™ PowerVault™ 715N Systems Installation and Troubleshooting Guide

- Help Overview
- Dell Contact Numbers

Help Overview

This section describes the tools Dell provides to help you when you have a problem with your computer. It also tells you when and how to contact Dell for technical or customer assistance.

Technical Assistance

If you need assistance with a technical problem, perform the following steps:

1. Use Dell's extensive suite of online services available at the Dell support website (**support.dell.com**) for help with installation and troubleshooting procedures.

   For more information, see "World Wide Web."

2. If the preceding step has not resolved the problem, call Dell for technical assistance.

   When prompted by Dell's automated telephone system, enter your Express Service Code to route the call directly to the proper support personnel. If you do not have an Express Service Code, open the **Dell Accessories** folder, double-click the **Express Service Code** icon, and follow the directions.

   NOTE: Dell's Express Service Code system may not be available in all countries.

   For instructions on using the technical support service, see "Technical Support Service" and "Before You Call."

Help Tools

Dell provides a number of tools to assist you. These tools are described in the following sections.

NOTE: Some of the following tools are not always available in all locations outside the continental U.S. Please call your local Dell representative for information on availability.

World Wide Web

The Internet is your most powerful tool for obtaining information about your computer and other Dell products. Through the Internet, you can access most of the services described in this section, including AutoTech, TechFax, order status, technical support, and product information.

You can access the Dell support website at **support.dell.com**. To select your country, click the map that appears. The **Welcome to support.dell.com** page opens. Enter your system information to access help tools and information.

Dell can be accessed electronically using the following addresses:

- World Wide Web

  http://www.dell.com/

  http://www.dell.com/ap/ (for Asian/Pacific countries only)

  http://www.euro.dell.com (for Europe only)

  http://www.dell.com/la (for Latin American countries)

Anonymous file transfer protocol (FTP)

ftp.dell.com/

Log in as user:anonymous, and use your e-mail address as your password.

- Electronic Support Service

support@us.dell.com

apsupport@dell.com (for Asian/Pacific countries only)

support.euro.dell.com (for Europe only)

- Electronic Quote Service

sales@dell.com

apmarketing@dell.com (for Asian/Pacific countries only)

- Electronic Information Service

info@dell.com

AutoTech Service

Dell's automated technical support service—AutoTech—provides recorded answers to the questions most frequently asked by Dell customers about their portable and desktop computer systems.

When you call AutoTech, you use your touch-tone telephone to select the subjects that correspond to your questions.

The AutoTech service is available 24 hours a day, seven days a week. You can also access this service through the technical support service. For the telephone number to call, see "Dell Contact Numbers."

TechFax Service

Dell takes full advantage of fax technology to serve you better. Twenty-four hours a day, seven days a week, you can call the Dell TechFax line toll-free for all kinds of technical information.

Using a touch-tone phone, you can select from a full directory of topics. The technical information you request is sent within minutes to the fax number you designate. For the TechFax telephone number to call, see "Dell Contact Numbers."

Automated Order-Status System

You can call this automated service to check on the status of any Dell products that you have ordered. A recording prompts you for the information needed to locate and report on your order. For the telephone number to call, see "Dell Contact Numbers."

Technical Support Service

Dell's industry-leading hardware technical-support service is available 24 hours a day, seven days a week, to answer your questions about Dell hardware. Our technical support staff use computer-based diagnostics to provide fast, accurate answers to questions.

To contact Dell's technical support service, see "Before You Call" and then call the number for your country as listed in "Dell Contact Numbers."

Problems With Your Order

If you have a problem with your order, such as missing parts, wrong parts, or incorrect billing, contact Dell for customer assistance. Have your invoice or packing slip handy when you call. For the telephone number to call, see "Dell Contact Numbers."

Product Information

If you need information about additional products available from Dell, or if you would like to place an order, visit the Dell website at **http://www.dell.com/**. For the telephone number to call to speak to a sales specialist, see "Dell Contact Numbers."

Returning Items for Warranty Repair or Credit

Prepare all items being returned, whether for repair or credit, as follows:

1. Call Dell to obtain an authorization number, and write it clearly and prominently on the outside of the box.

   For the telephone number to call, see "Dell Contact Numbers."

2. Include a copy of the invoice and a letter describing the reason for the return.

3. Include a copy of any tests you have run and any error messages reported by the diagnostics program.

4. Include any accessories that belong with the item(s) being returned (such as power cables, software floppy disks, and guides) if the return is for credit.

5. Pack the equipment to be returned in the original (or equivalent) packing materials.

   You are responsible for paying shipping expenses. You are also responsible for insuring any product returned, and you assume the risk of loss during shipment to Dell. Collect-on-delivery (C.O.D.) packages are not accepted.

Returns that are missing any of the preceding requirements will be refused at our receiving dock and returned to you.

Before You Call

NOTE: Have your Express Service Code ready when you call. The code helps Dell's automated-support telephone system direct your call more efficiently.

If possible, turn on your system before you call Dell for technical assistance and call from a telephone at or near the computer. You may be asked to type some commands at the keyboard, relay detailed information during operations, or try other troubleshooting steps possible only at the computer system itself. Make sure that the system documentation is available.

CAUTION: Before servicing any components inside your computer, see "Safety First—For You and Your System."

Dell Contact Numbers

The following table provides country-specific access codes and telephone numbers, websites, and email addresses that you can use to contact Dell.

The codes required depend on where you are calling from as well as the destination of your call; in addition, each country has a different dialing protocol. If you need assistance in determining which codes to use, contact a local or an international operator.

NOTE: Toll-free numbers are for use only within the country for which they are listed. Area codes are most often used to call long distance within your own country (not internationally)—in other words, when your call originates in the same country you are calling.

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-mail Address	Area Codes, Local Numbers, and Toll Free Numbers
Antigua and Barbuda	General Support	1-800-805-5924
Argentina (Buenos Aires) International Access Code: 00	Tech Support and Customer Care	toll free: 1-800-444-0733
	Sales	toll free: 1-800-444-3355
	Tech Support Fax	11 4515 7139

Country Code: 54 City Code: 11	Customer Care Fax	11 4515 7138
	Website: **http://www.dell.com.ar**	
Australia (Sydney) International Access Code: **0011** Country Code: **61** City Code: **2**	Home and Small Business	1-300-65-55-33
	Government and Business	toll free: 1-800-633-559
	Preferred Accounts Division (PAD)	toll free: 1-800-060-889
	Customer Care	toll free: 1-800-819-339
	Corporate Sales	toll free: 1-800-808-385
	Transaction Sales	toll free: 1-800-808-312
	Fax	toll free: 1-800-818-341
Austria (Vienna) International Access Code: **900** Country Code: **43** City Code: **1**	Home/Small Business Sales	01 795 67602
	Home/Small Business Fax	01 795 67605
	Home/Small Business Customer Care	01 795 67603
	Preferred Accounts/Corporate Customer Care	0660 8056
	Home/Small Business Technical Support	01 795 67604
	Preferred Accounts/Corporate Technical Support	0660 8779
	Switchboard	01 491 04 0
	Website: **support.euro.dell.com**	
	E-mail: tech_support_central_europe@dell.com	
Barbados	General Support	1-800-534-3066
Belgium (Brussels) International Access Code: **00** Country Code: **32** City Code: **2**	Technical Support	02 481 92 88
	Customer Care	02 481 91 19
	Home/Small Business Sales	toll free: 0800 16884
	Corporate Sales	02 481 91 00
	Fax	02 481 92 99
	Switchboard	02 481 91 00
	Website: **support.euro.dell.com**	
	E-mail: tech_be@dell.com	
	E-mail for French Speaking Customers: support.euro.dell.com/be/fr/emaildell/	
Bermuda	General Support	1-800-342-0671
Brazil International Access Code: **0021** Country Code: **55** City Code: **51**	Customer Support, Technical Support	0800 90 3355
	Tech Support Fax	51 481 5470
	Customer Care Fax	51 481 5480
	Sales	0800 90 3390
	Website: **http://www.dell.com/br**	
Brunei Country Code: **673**	Customer Technical Support (Penang, Malaysia)	604 633 4966
	Customer Service (Penang, Malaysia)	604 633 4949
	Transaction Sales (Penang, Malaysia)	604 633 4955
Canada (North York, Ontario) International Access Code: **011**	Automated Order-Status System	toll free: 1-800-433-9014
	AutoTech (Automated technical support)	toll free: 1-800-247-9362
	Customer Care (From outside Toronto)	toll free: 1-800-387-5759
	Customer Care (From within Toronto)	416 758-2400
	Customer Technical Support	toll free: 1-800-847-4096

	Sales (Direct sales—from outside Toronto)	toll free: 1-800-387-5752
	Sales (Direct sales—from within Toronto)	416 758-2200
	Sales (Federal government, education, and medical)	toll free: 1-800-567-7542
	Sales (Major accounts)	toll free: 1-800-387-5755
	TechFax	toll free: 1-800-950-1329
Cayman Islands	General Support	1-800-805-7541
Chile (Santiago) Country Code: **56** City Code: **2**	Sales, Customer Support, and Technical Support	toll free: 1230-020-4823
China (Xiamen) Country Code: **86** City Code: **592**	Home and Small Business Technical Support	toll free: 800 858 2437
	Corporate Accounts Technical Support	toll free: 800 858 2333
	Customer Experience	toll free: 800 858 2060
	Home and Small Business	toll free: 800 858 2222
	Preferred Accounts Division	toll free: 800 858 2062
	Large Corporate Accounts North	toll free: 800 858 2999
	Large Corporate Accounts East	toll free: 800 858 2020
	Large Corporate Accounts South	toll free: 800 858 2355
	Large Corporate Accounts GCP	toll free: 800 858 2055
	Large Corporate Accounts HK	toll free: 800 964108
	Large Corporate Accounts GCP HK	toll free: 800 907308
Colombia	General Support	980-9-15-3978
Costa Rica	General Support	0800-012-0435
Czech Republic (Prague) International Access Code: **00** Country Code: **420** City Code: **2**	Technical Support	02 22 83 27 27
	Customer Care	02 22 83 27 11
	Fax	02 22 83 27 14
	TechFax	02 22 83 27 28
	Switchboard	02 22 83 27 11
	Website: **support.euro.dell.com**	
	E-mail: czech_dell@dell.com	
Denmark (Horsholm) International Access Code: **00** Country Code: **45**	Technical Support	45170182
	Relational Customer Care	45170184
	Home/Small Business Customer Care	32875505
	Switchboard	45170100
	Fax Technical Support (Upplands Vasby, Sweden)	46 0 859005594
	Fax Switchboard	45170117
	Website: **support.euro.dell.com**	
	E-mail: den_support@dell.com E-mail Support for Servers: Nordic_server_support@dell.com	
Dominican Republic	General Support	1-800-148-0530
El Salvador	General Support	01-899-753-0777
Finland (Helsinki) International Access Code: **990**	Technical Support	09 253 313 60
	Technical Support Fax	09 253 313 81
	Relational Customer Care	09 253 313 38

Country Code: **358**	Home/Small Business Customer Care	09 693 791 94
City Code: **9**	Fax	09 253 313 99
	Switchboard	09 253 313 00
	Website: **support.euro.dell.com**	
	E-mail: fin_support@dell.com	
France (Paris)(Montpellier)	**Home and Small Business**	
International Access Code: **00**	Technical Support	0825 387 270
	Customer Care	0825 823 833
Country Code: **33**	Switchboard	0825 004 700
City Codes: **(1) (4)**	Switchboard (Alternative)	04 99 75 40 00
	Sales	0825 004 700
	Fax	0825 004 701
	Fax (Alternative)	04 99 75 40 01
	Website: **support.euro.dell.com**	
	E-mail: support.euro.dell.com/fr/fr/emaildell/	
	Corporate	
	Technical Support	0825 004 719
	Customer Care	0825 338 339
	Switchboard	01 55 94 71 00
	Sales	01 55 94 71 00
	Fax	01 55 94 71 01
	Website: **support.euro.dell.com**	
	E-mail: support.euro.dell.com/fr/fr/emaildell/	
Germany (Langen)	Technical Support	06103 766-7200
International Access Code: **00**	Home/Small Business Customer Care	0180-5-224400
	Global Segment Customer Care	06103 766-9570
Country Code: **49**	Preferred Accounts Customer Care	06103 766-9420
City Code: **6103**	Large Accounts Customer Care	06103 766-9560
	Public Accounts Customer Care	06103 766-9555
	Switchboard	06103 766-7000
	Website: **support.euro.dell.com**	
	E-mail: tech_support_central_europe@dell.com	
Guatemala	General Support	1-800-999-0136
Hong Kong	Technical Support	toll free: 800 96 4107
International Access Code: **001**	Customer Service (Penang, Malaysia)	604 633 4949
	Transaction Sales	toll free: 800 96 4109
Country Code: **852**	Corporate Sales	toll free: 800 96 4108
Ireland (Cherrywood)	Technical Support	1850 543 543
	Home User Customer Care	01 204 4095
International Access Code: **16**	Small Business Customer Care	01 204 4026
	Corporate Customer Care	01 279 5011
Country Code: **353**	Sales	01 204 4444
City Code: **1**	SalesFax	01 204 0144

	Fax	204 5960
	Switchboard	01 204 4444
	Website: **support.euro.dell.com**	
	E-mail: dell_direct_support@dell.com	
Italy (Milan)	**Home and Small Business**	
International Access Code: **00**	Technical Support	02 577 826 90
	Customer Care	02 696 821 14
Country Code: **39**	Fax	02 696 821 13
City Code: **02**	Switchboard	02 696 821 12
	Website: **support.euro.dell.com**	
	E-mail: support.euro.dell.com/it/it/emaildell/	
	Corporate	
	Technical Support	02 577 826 90
	Customer Care	02 577 825 55
	Fax	02 575 035 30
	Switchboard	02 577 821
	Website: **support.euro.dell.com**	
	E-mail: support.euro.dell.com/it/it/emaildell/	
Jamaica	General Support	1-800-682-3639
Japan (Kawasaki)	Technical Support (Server)	toll free: 0120-1984-35
International Access Code: **001**	Technical Support Outside of Japan (Server)	81-44-556-4152
	Technical Support (Dimension™ and Inspiron™)	toll free: 0120-1982-26
Country Code: **81**	Technical Support Outside of Japan (Dimension and Inspiron)	
City Code: **44**		81-44-520-1435
	Technical Support (Dell Precision™, OptiPlex™, and Latitude™)	toll free: 0120-1984-33
	Technical Support Outside of Japan (Dell Precision, OptiPlex, and Latitude)	81-44-556-3894
	24-Hour Automated Order Service	044 556-3801
	Customer Care	044 556-4240
	Business Sales Division (Up to 400 employees)	044 556 3494
	Preferred Accounts Division Sales (Over 400 employees)	044 556-3433
	Large Corporate Accounts Sales (Over 3500 employees)	044 556-3440
	Public Sales (Government agencies, educational institutions, and medical institutions)	044 556 3440
	Global Segment Japan	044 556 3469
	Individual User	044 556 1657
	Faxbox Service	044 556-3490
	Switchboard	044 556-4300
	Website: **support.jp.dell.com**	
Korea (Seoul)	Technical Support	toll free: 080-200-3800
International Access Code: **001**	Sales	toll free: 080-200-3600
	Customer Service (Seoul, Korea)	toll free: 080-200-3800
Country Code: **82**	Customer Service (Penang, Malaysia)	604 633 4949
City Code: **2**	Fax	2194-6202

	Switchboard	2194-6000
Latin America	Customer Technical Support (Austin, Texas, U.S.A.)	512 728-4093
	Customer Service (Austin, Texas, U.S.A.)	512 728-3619
	Fax (Technical Support and Customer Service)(Austin, Texas, U.S.A.)	512 728-3883
	Sales (Austin, Texas, U.S.A.)	512 728-4397
	SalesFax (Austin, Texas, U.S.A.)	512 728-4600
		or 512 728-3772
Luxembourg	Technical Support (Brussels, Belgium)	02 481 92 88
International Access Code: **00**	Home/Small Business Sales (Brussels, Belgium)	toll free: 080016884
	Corporate Sales (Brussels, Belgium)	02 481 91 00
Country Code: **352**	Customer Care (Brussels, Belgium)	02 481 91 19
	Fax (Brussels, Belgium)	02 481 92 99
	Switchboard (Brussels, Belgium)	02 481 91 00
	Website: **support.euro.dell.com**	
	E-mail: tech_be@dell.com	
Macau	Technical Support	toll free: 0800 582
Country Code: **853**	Customer Service (Penang, Malaysia)	604 633 4949
	Transaction Sales	toll free: 0800 581
Malaysia (Penang)	Technical Support	toll free: 1 800 888 298
International Access Code: **00**	Customer Service	04 633 4949
	Transaction Sales	toll free: 1 800 888 202
Country Code: **60**	Corporate Sales	toll free: 1 800 888 213
City Code: **4**		
Mexico	Customer Technical Support	001-877-384-8979
International Access Code: **00**		or 001-877-269-3383
	Sales	50-81-8800
Country Code: **52**		or 01-800-888-3355
	Customer Service	001-877-384-8979
		or 001-877-269-3383
	Main	50-81-8800
		or 01-800-888-3355
Netherlands Antilles	General Support	001-800-882-1519
Netherlands (Amsterdam)	Technical Support	020 581 8838
	Customer Care	020 581 8740
International Access Code: **00**	Home/Small Business Sales	toll free: 0800-0663
	Home/Small Business Sales Fax	020 682 7171
Country Code: **31**	Corporate Sales	020 581 8818
City Code: **20**	Corporate Sales Fax	020 686 8003
	Fax	020 686 8003
	Switchboard	020 581 8818
	Website: **support.euro.dell.com**	
	E-mail: tech_nl@dell.com	

New Zealand International Access Code: **00** Country Code: **64**	Home and Small Business	0800 446 255
	Government and Business	0800 444 617
	Sales	0800 441 567
	Fax	0800 441 566
Nicaragua	General Support	001-800-220-1006
Norway (Lysaker) International Access Code: **00** Country Code: **47**	Technical Support	671 16882
	Relational Customer Care	671 17514
	Home/Small Business Customer Care	23162298
	Switchboard	671 16800
	Fax Technical Support (Upplands Vasby, Sweden)	46 0 85 590 05 594
	Fax Switchboard	671 16865
	Website: **support.euro.dell.com**	
	E-mail: nor_support@dell.com E-mail Support for Servers: Nordic_server_support@dell.com	
Panama	General Support	001-800-507-0962
Peru	General Support	0800-50-669
Poland (Warsaw) International Access Code: **011** Country Code: **48** City Code: **22**	Customer Service Phone	57 95 700
	Customer Care	57 95 999
	Sales	57 95 999
	Customer Service Fax	57 95 806
	Reception Desk Fax	57 95 998
	Switchboard	57 95 999
	Website: **support.euro.dell.com**	
	E-mail: pl_support@dell.com	
Portugal International Access Code: **00** Country Code: **35**	Technical Support	35 800 834 077
	Customer Care	800 300 415 or 35 800 834 075
	Sales	800 300 410 or 800 300 411 or 800 300 412 or 351 214 220 710
	Fax	35 121 424 01 12
	E-mail: support.euro.dell.com/es/es/emaildell/	
Puerto Rico	General Support	1-800-805-7545
St. Lucia	General Support	1-800-882-1521
Singapore (Singapore) International Access Code: **005** Country Code: **65**	Technical Support	toll free: 800 6011 051
	Customer Service (Penang, Malaysia)	604 633 4949
	Transaction Sales	toll free: 800 6011 054
	Corporate Sales	toll free: 800 6011 053
South Africa (Johannesburg) International Access Code: **09/091** Country Code: **27** City Code: **11**	Technical Support	011 709 7710
	Customer Care	011 709 7707
	Sales	011 709 7700
	Fax	011 706 0495
	Switchboard	011 709 7700
	Website: **support.euro.dell.com**	

	E-mail: dell_za_support@dell.com	
Southeast Asian and Pacific Countries	Customer Technical Support, Customer Service, and Sales (Penang, Malaysia)	604 633 4810
Spain (Madrid)	**Home and Small Business**	
International Access Code: **00**	Technical Support	902 100 130
	Customer Care	902 118 540
Country Code: **34**	Sales	902 118 541
City Code: **91**	Switchboard	902 118 541
	Fax	902 118 539
	Website: **support.euro.dell.com**	
	E-mail: support.euro.dell.com/es/es/emaildell/	
	Corporate	
	Technical Support	902 100 130
	Customer Care	902 118 546
	Switchboard	91 722 92 00
	Fax	91 722 95 83
	Website: **support.euro.dell.com**	
	E-mail: support.euro.dell.com/es/es/emaildell/	
Sweden (Upplands Vasby)	Technical Support	08 590 05 199
	Relational Customer Care	08 590 05 642
International Access Code: **00**	Home/Small Business Customer Care	08 587 70 527
Country Code: **46**	Fax Technical Support	08 590 05 594
	Sales	08 590 05 185
City Code: **8**	Website: **support.euro.dell.com**	
	E-mail: swe_support@dell.com	
	E-mail Support for Latitude and Inspiron: Swe-nbk_kats@dell.com	
	E-mail Support for OptiPlex: Swe_kats@dell.com	
	E-mail Support for Servers: Nordic_server_support@dell.com	
Switzerland (Geneva)	Technical Support (Home and Small Business)	0844 811 411
	Technical Support (Corporate)	0844 822 844
International Access Code: **00**	Customer Care (Home and Small Business)	0848 802 202
Country Code: **41**	Customer Care (Corporate)	0848 821 721
	Fax	022 799 01 90
City Code: **22**	Switchboard	022 799 01 01
	Website: **support.euro.dell.com**	
	E-mail: swisstech@dell.com	
	E-mail for French Speaking HSB and Corporate Customers: support.euro.dell.com/ch/fr/emaildell/	
Taiwan	Technical Support	toll free: 0080 60 1255
	Technical Support (Servers)	toll free: 0080 60 1256
International Access Code: **002**	Transaction Sales	toll free: 0080 651 228
Country Code: **886**		or 0800 33 556
	Corporate Sales	toll free: 0080 651 227

		or 0800 33 555
Thailand International Access Code: **001** Country Code: **66**	Technical Support	toll free: 0880 060 07
	Customer Service (Penang, Malaysia)	604 633 4949
	Sales	toll free: 0880 060 09
Trinidad/Tobago	General Support	1-800-805-8035
U.K. (Bracknell) International Access Code: **00** Country Code: **44** City Code: **1344**	Technical Support (Corporate/Preferred Accounts/PAD [1000+ employees])	0870 908 0500
	Technical Support (Direct/PAD and general)	0870 908 0800
	Global Accounts Customer Care	01344 723186
	Home and Small Business Customer Care	0870 906 0010
	Corporate Customer Care	01344 72 3185
	Preferred Accounts (500-5000 employees) Customer Care	01344 723196
	Central Government Customer Care	01344 723193
	Local Government Customer Care	01344 723194
	Home/Small Business Sales	0870 907 4000
	Corporate/Public Sector Sales	01344 860456
	Website: **support.euro.dell.com**	
	E-mail: dell_direct_support@dell.com	
U.S.A. (Austin, Texas) International Access Code: **011** Country Code: **1**	Automated Order-Status System	toll free: 1-800-433-9014
	AutoTech (For portable and desktop computers)	toll free: 1-800-247-9362
	Dell Home and Small Business Group (For portable and desktop computers):	
	Customer Technical Support (Return material authorization numbers)	toll free: 1-800-624-9896
	Customer Technical Support (Home sales purchased via **http://www.dell.com**)	toll free: 1-877-576-3355
	Customer Service (Credit return authorization numbers)	toll free: 1-800-624-9897
	National Accounts (Computers purchased by established Dell national accounts [have your account number handy], medical institutions, or value-added resellers [VARs]):	
	Customer Service and Technical Support (Return material authorization numbers)	toll free: 1-800-822-8965
	Public Americas International (Computers purchased by governmental agencies [local, state, or federal] or educational institutions):	
	Customer Service and Technical Support (Return material authorization numbers)	toll free: 1-800-234-1490
	Dell Sales	toll free: 1-800-289-3355 or toll free: 1-800-879-3355
	Spare Parts Sales	toll free: 1-800-357-3355
	Desktop and Portable Fee-Based Technical Support	toll free: 1-800-433-9005
	Sales (Catalogs)	toll free: 1-800-426-5150
	Fax	toll free: 1-800-727-8320
	TechFax	toll free: 1-800-950-1329
	Dell Services for the Deaf, Hard-of-Hearing, or Speech-Impaired	toll free: 1-877-DELLTTY (1-877-335-5889)
	Switchboard	512 338-4400
	DellNet™ Technical Support	toll free: 1-877-Dellnet

		(1-877-335-5638)
US Virgin Islands	General Support	1-877-673-3355
Venezuela	General Support	8001-3605

Abbreviations and Acronyms

Dell™ PowerVault™ 715N Systems Installation and Troubleshooting Guide

A

ampere(s)

AC

alternating current

ANSI

American National Standards Institute

APM

advanced power management

BIOS

basic input/output system

C

Celsius

CD

compact disc

cm

centimeter(s)

CMOS

complementary metal-oxide semiconductor

CPU

central processing unit

DC

direct current

DHCP

Dynamic Host Configuration Protocol

DIMM

dual in-line memory module

DMA

direct memory access

DMI

desktop management interface

dpi

dots per inch

DRAM

dynamic random-access memory

ECC

error checking and correction

EDO

extended-data out

EGA

enhanced graphics adapter

EIDE

enhanced integrated drive electronics

EMI

electromagnetic interference

EMM

expanded memory manager

EMS

Expanded Memory Specification

EPP

Enhanced Parallel Port

EPROM

erasable programmable read-only memory

ESD

electrostatic discharge

ESDI

enhanced small-device interface

ESM

embedded server management

F

Fahrenheit

FAT

file allocation table

FCC

Federal Communications Commission

ft

feet

g

gram(s)

GB

gigabyte(s)

GUI

graphical user interface

Hz

hertz

I/O

input/output

ID

identification

IDE

integrated drive electronics

IPX

Internet packet exchange

IRQ

interrupt request

ISA

Industry-Standard Architecture

KB

kilobyte(s)

KB/sec

kilobyte(s) per second

kg

kilogram(s)

kHz

kilohertz

L2

Level 2

LAN

local area network

lb

pound(s)

LED

light-emitting diode

LVD

low voltage differential

m

meter(s)

mA

milliampere(s)

mAh

milliampere-hour(s)

MB

megabyte(s)

MHz

megahertz

mm

millimeter(s)

ms

millisecond(s)

MS-DOS®

Microsoft® Disk Operating System

mV

millivolt(s)

NAS

network attached storage

NIC

network interface controller

NIS

network information service

NiCad

nickel cadmium

NMI

nonmaskable interrupt

ns

nanosecond(s)

NTFS

NT File System

NVRAM

nonvolatile random-access memory

PCI

Peripheral Component Interconnect

PDU

power distribution unit

PGA

pin grid array

POST

power-on self-test

RAID

redundant array of independent disks

RAM

random-access memory

RAS

remote access services

RGB

red/green/blue

ROM

read-only memory

rpm

revolutions per minute

RTC

real-time clock

SCA

Single Controller Architecture

sec

second(s)

SDRAM

synchronous dynamic random-access memory

SIMM

single in-line memory module

SMBus

system management bus

SNMP

Simple Network Management Protocol

SDRAM

synchronous dynamic random-access memory

TCP/IP

Transmission Control Protocol/Internet Protocol

UART

universal asynchronous receiver-transmitter

UPS

uninterruptible power supply

UTP

unshielded twisted pair

V

volt(s)

VAC

volt(s) alternating current

VDC

volt(s) direct current

VGA

video graphics array

VRAM

video random-access memory

W

watt(s)

WH

watt-hour(s)

ZIF

zero insertion force